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PATENT APPLICATION

ATTORNEY DOCKET NO. 30012962-3US

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Lawrence WILCOCK et al.

Confirmation No.: 5705

Application No.: 10/059,096

Examiner: COREY P CHAU

Filing Date: January 29, 2002

Group Art Unit: 2615

Title: AUDIO USER INTERFACE WITH CYLINDRICAL AUDIO FIELD ORGANIZATION

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on January 7, 2008.

☒ The fee for filing this Appeal Brief is $510.00 (37 CFR 41.20).

☐ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120 ☐ 2nd Month $460 ☐ 3rd Month $1050 ☐ 4th Month $1640

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 510. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

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Typed Name: Christina Frye

Signature: Christina Frye

Respectfully submitted,

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Serial No. 10/059,096 Docket No. 30012962-3 US (1509-264)

THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	
Inventors: Lawrence WILCOCK et al.	: Confirmation No. 5705
	:
U.S. Patent Application No. 10/059,096	: Group Art Unit: 2615
	:
Filed: January 29, 2002	: Examiner: COREY P CHAU
For: METHOD, SYSTEM AND COMPUTER PROGRAM PRODUCT FOR MONITORING OBJECTS IN AN IT NETWORK	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Attn: BOARD OF PATENT APPEALS AND INTERFERENCES

BRIEF ON APPEAL

Further to the Notice of Appeal filed January 7, 2008, in connection with the above-identified application on appeal, herewith is Appellant's Brief on Appeal. The Commissioner is authorized to charge Deposit Account No. 08-2025 in the amount of $510 for the statutory fee.

To the extent necessary, Appellant hereby requests any required extension of time under 37 C.F.R. §1.136 and hereby authorizes the Commissioner to charge any required fees not otherwise provided for to Deposit Account No. 08-2025.

CERTIFICATION OF FACSIMILE TRANSMISSION
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I. Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, L.P., a Texas limited partnership.

II. Related Appeals and Interferences

There are no related appeals and/or interferences.

III. Status of Claims

A. There are 68 claims in the application, identified as claims 1-68.

B. Claims canceled: None

C. Claims withdrawn from consideration but not canceled: None

D. Claims pending: 1-68

E. Claims allowed: None

F. Claims rejected: 1-68

G. Claims on appeal: 1-68

IV. Status of Amendments

All amendments have been entered. There was no amendment after final rejection.

V. Summary of Claimed Subject Matter

Independent claims 1, 28 and 46 are directed to substantially the same subject matter, with claim 1 being directed to an audio user-interfacing method, claim 28 requiring an apparatus for providing an audio user interface, and claim 46 defining an

apparatus for providing an audio user interface. In all three claims, each of a plurality of items is represented in an audio field by plural synthesized sound sources 40 from which sounds related to a particular item appear to emanate (Figs. 6-8, page 18, line 19). For each sound source, such as sound source 40A, Fig. 4, a determination is made of an associated rendering position where the synthesized sound source appears to emit sounds in the audio field including source 40A and other sources 40.

To understand the concept of rendering position, consider Fig. 4, wherein all of the sound sources 40 and 40A to be synthesized are in an audio field that lies on the surface of a sphere (page 17, lines 20-24). In Fig. 4, the user is wearing a pair of headphones and is assumed to have turned his head from the straight ahead position through an azimuth angle X2° (page 17, line 25). The straight ahead position of the user is indicated by audio field reference vector 42, while the turning angle of the user's head is indicated by presentation reference vector 44 (page 17, lines 25-28). The synthesized sound source 40A is azimuthally displaced from audio field reference vector 42 through an angle X1° (page 17, lines 22-24). Presentation reference vector 44 is also coincident with the center line between the headphones, indicated in Fig. 1 by audio output devices 11 (page 11, lines 9-12; page 10, lines 24-26). The azimuthal rendering position of sound source 40A relative to presentation reference vector 44 is equal to the azimuth angle (X1°) of sound source 40A from audio reference vector 42 minus the azimuthal angle of head rotation (X2°), so that the azimuth angle of the rendering position relative to presentation reference vector 44 is X1° - X2° (page 17, lines 29-30). In the spherical field of Fig. 4, where synthesized source 40A is at an

elevation of Y1°, the elevation rendering position remains at Y1° (page 17, lines 29-32).

In the system of each of Figs. 6-8, where sound sources 40 lie on a cylindrical surface and the user is on the axis of the cylindrical surface, the associated rendering position where each synthesized sound source is located is determined in a similar manner through the use of presentation reference vector 54 and audio field reference vector 52 (page 18, lines 15-29). In the cylindrical field example of Figs. 6-8, only two coordinates are necessary to identify the location of each synthesized sound source 40 because all the synthesized sound sources are located on the cylindrical surface and thus are equidistant from the longitudinal axis of the vertically-oriented cylinder; the two coordinates are the azimuth angle X° and elevation or height Y, both measured relative to horizontal audio-field reference vector 52 (page 18, lines 18-22).

Audio output devices 11, being headphones on the user, are actually or notionally located inside the cylindrical locus of points defined by the cylindrical surface of Figs. 6-8 (Figs. 4, 5, 7 and 8; page 10, lines 24-26; page 11, lines 9-11).

The foregoing steps of claim 1 are performed by a processor arrangement illustrated, for example, in Fig. 1 or Fig. 10, as defined by claim 28 (page 9, lines 26-28; page 18, lines 15 and 16; page 23, lines 16 and 17).

Apparatus claim 46 requires a rendering-position determining arrangement operative to determine for each sound source an associated rendering position at which the synthesized sound source is to sound in an audio field, wherein the rendering positions associated with the sound sources are on at least a portion of a

cylindrical locus of points. In the embodiment of Fig. 1, combiner 30 and the structures to which the combiner is responsive perform such a function (page 13, lines 30 and 31). Claim 46 also recites a rendering subsystem that includes spatialization processor 10 and source rendering position memory 15, as well as audio output devices, that are arranged to generate an audio field in which the sound sources are synthesized at their associated rendering positions to provide sounds related to the items associated with the synthesized sound sources (page 17, lines 1-7). Claim 46 also requires the audio output devices 11 (e.g., headphones on the user), to be actually or notionally located inside the cylindrical locus of points (Figs. 7 and 8; page 10, lines 24-26; page 11, lines 9-11).

Independent method claim 15 is similar in certain respects to independent method claim 1. However, claim 15 does not require the synthesized sound sources to be on at least a portion of a cylindrical locus of points and, therefore, does not require the audio output devices to be located closer to a user of the audio output devices than the cylindrical locus of points. However, claim 15 does require the audio output devices 11 (e.g., headphones on the user in each of Figs. 4, 5, 7 and 8) to be actually or notionally located closer to a user of the audio output devices than the positions of the plural synthesized sound sources (page 10, lines 24-26; page 11, lines 26-26). In addition, claim 15 requires the audio field to be explored by rotating it about a predetermined axis (the vertical axis of the sphere in Figs. 4 and 5 on the vertical axis of the cylinder of Figs. 6-8), and by displacing the audio field in a direction parallel to that axis, wherein the rotating and displacing steps can be performed in any order or

together (page 5, lines 16-18; page 6, line 31-page 7, line 2; page 17, lines 18-20; page 10, lines 15-18).

Independent claim 37 is concerned with an apparatus for providing an audio user interface, as illustrated in Fig. 1. Each of a plurality of items is represented in the audio field (for example, the spherical field of Fig. 4 or the cylindrical field of Fig. 6) by two or more synthesized sound sources 40 from which sounds related to the item appear to emanate. The apparatus comprises audio output devices 11, for example, in the form of a set of headphones (Figs. 1, 4, 5, 7 or 8; page 10, lines 21, 22 and 24). The headphones are actually or notionally located closer to the user illustrated in Figs. 4, 5, 7 or 8 than the positions of synthesized sound sources 40 that are located on the spheres of Figs. 4 and 5 or the cylindrical surfaces of Figs. 6-8. The apparatus also includes a processor arrangement, in the form of combiner 30, Fig. 1, for determining, for each sound source 40, an associated rendering position where the sound source is to be synthesized in the audio field (page 16, lines 18 and 19). The rendering position is at the intersection of the audio field, which has a spherical shape in Figs. 4 and 5, and a cylindrical shape in Figs. 6-8 and is displaced from the position of the sound source, such as sound source 40A, so that the azimuthal rendering position is at the angle X1° - X2°, Fig. 4, where X1° is the azimuth angle of source 40A from audio field reference vector 42, which corresponds with the straight ahead position of the user, and X2° is the turning angle of the head of the user relative to the straight ahead position, as indicated by presentation reference vector 44, Fig. 4 (page 17, lines 20-31). The rendering position has an elevation in the embodiments of Figs. 4 and 6 that

is the same as the elevation angle of source 40A above the plane including audio field reference vector 42 (page 16, lines 17-21; page 17; line 30; page 20, lines 20 and 21).

Subsystem 13 of the processor arrangement sets the location of each sound source 40 relative to audio field reference 42, as illustrated in Figs. 4 and 5, or audio field reference 52, as illustrated in Figs. 6-8 (page 14, lines 4-6).

The processor arrangement also includes audio field orientation modifying block 26 for controlling an offset between the audio field reference 42 or the audio field reference 52 and the presentation vector 44 or the presentation vector 54; the offset is determined by the location of audio output devices 11 (e.g., the headphones) as indicated by head tracker 33, having an input supplied to audio field orientation modifying block 26 (page 15, line 31-page 16, line 7). Head tracker 33 is the claimed user input arrangement that enables the user to set the rotation of the audio field about the vertical axis coincident with the body of the user, in Fig. 4, and about the vertical axis defined by the dotted line in Figs. 6-8 (page 11, lines 9-18). User input 28 to block 26 also enables the user to displace of the audio field including synthesized sources 40 and 40A relative to the horizontal plane of presentation reference 44 in a direction parallel to the vertical axis (page 20, lines 18-20). The processor arrangement, including combiner 30 and spatialization processor 10, derives the rendering position of each sound source 40 based on the location of the sound source in the audio field and the offset derived by audio field orientation modifying block 26 (page 16, lines 17-21).

Headphones 11 and spatialization processor 10 generate an audio field in which sound sources 40 are synthesized at their associated rendering positions to provide sounds related to the items (page 17, lines 1-3).

The preamble of claim 55 is identical to that of claim 37. The apparatus of claim 55 includes a rendering-position determining arrangement that determines, for each sound source 40, an associated rendering position where the sound source is to be synthesized in the audio field including sound sources 40. The rendering-position determining arrangement includes a setting arrangement (page 14, lines 4-6), in the form of subsystem 13, for setting the location of each sound source 40 relative to an audio-field reference, in the form of vector 42, Figs. 4 and 5, or vector 52, Figs. 6-8. The rendering-position determining arrangement also includes a control arrangement, in the form of audio field orientation modifying block 26 for controlling an offset between the audio field reference 42 or 52 and a presentation reference, in the form of vector 44 or vector 54 (page 15, line 31-page 16, line 7). The predetermined reference is determined by the location of audio output devices 11, preferably a headset mounted on a user illustrated in Figs. 4, 5, 7 and 8 (page 15, line 31-page 16, line 7). The control arrangement also includes head-tracker 33 (Fig. 1; page 11, lines 9-18) and a user input 28 that respectively rotate the audio field about the vertical axes illustrated in Figs. 4-8 and displace the audio field relative to presentation vector 44 or 54 in a direction parallel to the vertical axis (page 20, lines 18-20). Combiner 30 responds to the positions of synthesized sources 40 and the offset determined by block 26 to derive the rendering position of each sound source 40 (page 16, lines 17-21). A rendering subsystem including spatialization processor 10 and headphones 11

generates an audio field in which the sound sources are synthesized at their associated rendering positions to provide sounds related to the items (page 17, lines 1-3). Headphones 11 are actually or notionally located closer to a user of the headphones than the positions of synthesized sound sources 40 (Figs. 4, 5, 7 and 8; page 10, lines 24-26; page 11, lines 9-11).

Dependent claim 2 requires the audio field of claim 1 to be displaced in a direction parallel to the longitudinal (i.e., vertical in Figs. 6-8) axis of the cylindrical locus of points so that there is a change in the portion of the field closest to a reference position where a user of the audio output devices 11 is actually or notionally located (page 18, lines 27-29; Fig. 6).

Claim 3 indicates the audio field is rotated about the longitudinal axis (the vertical axis illustrated in Fig. 6) of the cylindrical locus of points (page 18. lines 23-25). Claims 4, 16, 31, 38, 49 and 56 require the audio field to be displaced in discrete steps of predetermined magnitude (page 19, lines 30-32; Fig. 8).

Claims 5 and 17 require the longitudinal axis of the cylindrical locus of points to be vertically disposed, as indicated in Fig. 8, and the sound sources to be located at differing levels corresponding to floors of a building; the predetermined magnitude of the displacement in discrete steps corresponds to moving the field up or down one floor (page 19, lines 30-32; Fig. 8).

Claims 6 and 18 indicate the sound sources 40 are arranged in groups, with the sound sources in each group being at the same position along the axis, as illustrated in Fig. 8. The groups are separate one from another along the axis by distances

corresponding to multiples, including one, of the predetermined magnitude (page 19, lines 27-29).

Claims 9, 21, 34, 41, 52 and 59 state the sound sources outside of a focus zone, as illustrated in Fig. 8, are fully muted. An audio indication signals that the sound sources beyond the focus zone are present in the audio field (page 19, lines 5-8). The audio indication is stored in memory 14 of subsystem 13 (Fig. 15, includes collection representing sound source 20; page 30, line 26-page 31 line 24).

Claims 10, 22, 36, 45, 54 and 63 indicate the audio field is stabilized relative to any one of a user's head, a user's body, a vehicle in which the user is traveling, and the world (page 11, line 6-page 12, line 4). Claims 10 and 22 also require the stabilization to take into account whether the audio output devices are world, vehicle, body or head mounted, and as appropriate, rotation of the user's head or body, or of the vehicle, about an axis parallel to the longitudinal axis of the cylindrical locus of points (page 10, lines 15-28).

Claims 23, 42 and 60 indicate that the sound sources are distributed over at least a portion of a cylindrical locus of points (Figs. 6-8; page 18, line 18). Claims 24, 43 and 61 are similar to claims 23, 42 and 60 and require the sound sources to be distributed in three dimensions in terms of a cylindrical coordinate system referenced to the axis (Figs. 6-8; page 18, line 18).

Claim 29, dependent on claim 28, states the processor arrangement of Fig. 1 is arranged for setting the location of each sound source 40 relative to audio field reference 52, a function performed, inter alia, by subsystem 13 (Fig. 1; page 18, lines

15-29). Claim 29 also indicates the processor arrangement of Fig. 1 controls an offset between audio field reference 52 and presentation reference 54, as determined by the location of audio output devices 11. The offset control is provided by audio field orientation modifying block 26 (page 15, line 31-page 16, line 7). The processor arrangement includes a user input arrangement including head tracker 33 that supplies an input to offset control block 26 and enables the user to set a displacement of the audio field including sound sources 40 relative to presentation reference 54 in a direction parallel to the longitudinal axis of the cylindrical locus of points, i.e., the vertical axis illustrated in Figs. 6-8 (page 15, line 31-page 16, line 7). The processor arrangement derives the rendering position of each sound source based on the location of the sound source in the audio field and the offset, a result provided by audio output devices 11 and spatialization processor 10 in response to the output of combiner 30 (page 17, lines 1-3).

Claims 30 and 48, dependent on claim 29, indicate the processor arrangement, in the form of offset block 26, enables the user to set the rotation of the audio field about the longitudinal axis of the cylindrical locus of points, i.e., the vertical axis of the cylinders illustrated in Figs. 6-8, that responds to head tracker 33 (page 11, lines 9-18).

Claims 31 and 56, respectively dependent on claims 29 and 55, indicate the processor arrangement or the controller arrangement, in the form of offset block 26, enables the audio field to be displaced in the direction parallel to the longitudinal vertical axis only in discrete steps of predetermined magnitude, a result achieved as a

result of processor 26 being responsive to input 28 thereof (Fig. 8, page 19, lines 30-32).

Claim 47, dependent on claim 46, states the rendering-position determining arrangement of claim 46 includes a setting arrangement, in the form of subsystem 13, for setting the location of each of sound sources 40 relative to audio field reference 52 (page 14, lines 4-6). Claim 47 also requires the rendering-position determining arrangement to include a control arrangement, in the form of offset block 26, for controlling an offset between audio-field reference 42 or 52 and a presentation reference 44 or 54, determined by the location of audio output devices 11 (page 15, line 31-page 16, line 7). The control arrangement includes a user input arrangement, in the form of head tracker 33. The control arrangement also is operative to enable a user to set a displacement of the audio field relative to the presentation reference in a direction parallel to the longitudinal axis of the cylindrical locus of points, a result achieved by user input 28 that is coupled to offset arrangement 26 (page 20, lines 18-20). Claim 47 also indicates the rendering-position determining arrangement includes a deriving arrangement, in the form of combiner 30 and spatialization processor 10, wherein the deriving arrangement derives the rendering position of each sound source 40 based on the location of the sound source in the audio field and the offset derived by offset block 26 (page 17, lines 1-3).

Claim 48, dependent on claim 47, indicates the control arrangement, in the form of offset block 26, enables a user to set the rotation of the audio field about the axis of the cylindrical locus of points, that is, the vertical axis illustrated in Figs. 6-8. This

result is achieved by offset block 26 being responsive to head tracker 33 (page 15, line 31-page 16, line 7).

Claim 49, dependent on claim 47, requires the control arrangement, in the form of offset block 26, to displace the audio field including synthesized sound sources 40 in the direction of the longitudinal axis only in discrete steps of predetermined magnitude (Fig. 8, page 19, lines 30-32).

Claims 60, 66 and 67, dependent on claim 55, require the rendering position determining arrangement to cause the sound sources 40 to be on at least a portion of a cylindrical locus of points, as illustrated in Figs. 6-8, and discussed *supra* in connection with claim 1.

Claims 64 and 65 indicate the audio output devices are stereo headphones on the head of the user (page 11, lines 29, 30).

VI. Grounds of Rejection to be Reviewed on Appeal

A. Claims 1-68 are not rendered obvious by Massie et al., US Patent 5,943,427, in view of Arnold et al., US Patent 6,154,549.

VII. Argument

A. The Office Action incorrectly relies on Arnold et al. to disclose the requirement of independent claims 1, 28 and 46 for the rendering positions of synthesized sound sources to be on at least a portion of a cylindrical locus of points.

Page 3, antepenultimate paragraph of the final rejection, states: "Arnold discloses that…the three-dimensional audio space/environment can also be defined in

cylindrical coordinates (fig. 16). Col. 25, lines 65-col. 26, line 67." The Office Action goes on to state that because Arnold discloses a three-dimensional cylindrical coordinate system, it would have been obvious that the rendering positions associated with the sound sources are on at least a portion of a cylindrical locus of points.

While Arnold et al. discloses, in Fig. 16 (that is described at column 25, line 65-column 26, line 23), a cylindrical coordinate system, there is nothing in Arnold et al. to indicate the rendering positions of synthesized sound sources are on at least a portion of a cylindrical locus of points. In order to meet the requirement for synthesized sound sources to be on a cylindrical locus of points or a portion of a cylindrical locus of points, it is necessary for at least two sound sources to be at the same radial distance from the axis of the cylindrical locus of points. However, Arnold has no disclosure of at least two synthesized sound sources being at the same radial position from an axis of a cylindrical locus of points.

The Office Action also mentions column 26, lines 23-67, and column 11, lines 41-54 of Arnold et al. The remaining portion of column 26, i.e., the portion between lines 23 and 67 indicates a spatial environment may be based on the combination of plural spatial environments, such as the planar spatial environment of Fig. 3 and the three-dimensional circular spatial environment of Fig. 5. In addition, Fig. 17, directed to a three-dimensional spherical spatial environment is discussed. There is no discussion in any of these portions in the remainder of column 26 of the rendering positions of synthesized sound sources being on at least a portion of a cylindrical locus of points.

Column 11, lines 41-54, of Arnold et al. merely indicates tables 38, that store the attenuation values for the electric to acoustic transducers 16 for various locations in the various geometries disclosed by Arnold et al., can represent various simulated environments and can be used to alter the sound being produced if a user directs movement from one environment, such as a first room of a computer game, to another environment, such as a second room of a computer game. Certainly, this has nothing to do with the foregoing requirement of claims 1, 28 and 46.

Because Arnold et al. has no disclosure of rendering positions of synthesized sound sources being on at least a portion of a cylindrical locus of points, the rejections of independent claims 1, 28 and 46, and the dependent claims that also include this limitation are wrong.

B. No attempt has been made to establish a prima facie case of obviousness with regard to independent claims 15, 37 or 55, because the final rejection erroneously states these claims are similar to claim 1 and provides no rationale as to why claims 15, 37 or 55 are obvious as a result of Massie et al. and Arnold et al.

The statement in the Office Action that claims 15, 37 and 55 are similar to claim 1 and can therefore be rejected on the same rationale as set forth for claim 1 is patently incorrect. Firstly, none of claims 15, 37 or 55 includes the requirement of claim 1 for the rendering positions of synthesized sound sources to be on at least a portion of a cylindrical locus of points.

Claim 15 requires an audio field in which plural items are represented by synthesized sound sources to be <u>explored</u> by rotating the audio field about a

predetermined axis and displacing the audio field in a direction parallel to its axis. The foregoing exploring steps of claim 15 are not included, nor are they inherent, in claim 1. Because the exploring steps are not considered by the Office Action in connection with claim 1, the rejection of claim 15 is incorrect.

Independent apparatus claim 37 differs from claim 1 by defining the location of each synthesized sound source relative to an audio-field reference and controlling an offset between the audio-field reference and a presentation reference determined by the location of audio output devices. Claim 37 also requires a processor arrangement to include a user input arrangement and to be operative to enable a user to set a rotation of the audio field about a predetermined axis, set a displacement of the audio field relative to the presentation reference in a direction parallel to the axis, and to derive the rendering position of each sound source based on the location of the sound source in the audio field and the offset. Because none of the foregoing limitations are found in claim 1 there is no attempt to establish a prima facie case of obviousness concerning claim 37.

Claim 55 differs from claim 1 by requiring an apparatus for providing an audio user interface to include a rendering-position determining arrangement comprising a setting arrangement for setting the location for each synthesized sound source relative to an audio-field reference, as well as a control arrangement for controlling an offset between the audio-field reference and a presentation reference determined by the location of audio output devices. The control arrangement includes a user input device and is operative to enable a user to set a rotation of the audio field about a predetermined axis and to set a displacement of the audio field relative to the

presentation reference in a direction parallel to the axis. The control arrangement also includes a deriving arrangement for deriving the rendering position of each sound source based on the location of the sound source in the audio field and the offset. None of the foregoing limitations is included in claim 1.

Based on the foregoing, the statements set forth in the final rejection concerning independent claims 15, 37 and 55 being similar to claim 1 are erroneous. Because no prima facie case has been established with regard to claims 15, 37 and 55, the rejection thereof cannot stand.

C. One of ordinary skill in the art would not have modified Massie et al. as a result of Arnold et al. because Arnold et al. is not compatible with Massie et al.

While both references are concerned with synthesizing sound sources, the techniques and apparatus employed by Massie et al. and Arnold et al. are so different from each other that one of ordinary skill in the art would not have modified Massie et al. as a result of Arnold et al. In addition, the Office Action does not indicate how one of ordinary skill in the art would have modified Massie et al as a result of Arnold et al..

Massie et al. synthesizes the position of one or more sound sources, such as emitter 208, Fig. 2, relative to user 202. The sound synthesized by emitter(s) 208 is supplied to user 202 either by loud speakers 14 and 16, Fig. 1A, or through headphones; col. 4, line 61. The speakers or headphones are supplied with left and right channel outputs; col. 4, lines 59-61.

Fig. 4 of Massie et al. is a block diagram of the apparatus used to synthesize emitter 208. The sound emitted by emitter 208 is supplied to interpolating memory access controller 414 and the position of the synthesized sound emitted by emitter 208 relative to user 202 is determined by position processor 201. The position of emitter 208 relative to user 202 is expressed in terms of elevation, azimuth and radial distance. Doppler processing unit 402 determines a phase shift ratio in response to the radial velocity of emitter 208 relative to user 202 in response to an output of position processor 401 indicative of the radial movement of the emitter relative to the user.

Interaural time delay (ITD) processor 404 responds to the elevation and azimuth of emitter 208 relative to user 202 to determine an ITD value that simulates the difference in time delay perceived between each ear of the user. The outputs of Doppler processor 402 and ITD processor 404 are applied to interpolating memory access controller 414, which responds to a sound input signal to the circuitry of Fig. 4, whereby controller 414 modifies the synthesized sound applied to controller 404. As a result, controller 414 derives left and right channel output signals having different amplitudes, based on the outputs of processors 402 and 404.

The left and right channel outputs of controller 414 are applied to shaper filters 416 that also respond to outputs of processor 406 and processor 408. Processor 406 responds to the azimuth and elevation outputs of processor 401 to simulate head shadowing and pinna reflection off the ear of user 202, based on the azimuth and elevation of synthesized emitter 208 relative to user 202. Air absorption processor 408 responds to the distance between emitter 208 and user 202 to calculate filter

parameters that simulate the effects of air absorption between the emitter and listener. Filters 416 derive shaped left and right channel outputs that are applied to variable gain amplifiers in gain unit 418.

Gain unit 418 responds to an output of distance processor 410, indicative of the distance between emitter 208 and user 202. Interaural level difference (ILD) processor 412 responds to the azimuth and elevation outputs of position processor 401 to control the relative amplification of the left and right channels. As a result, gain unit 418 produces left and right channel output signals having different amplitudes and phases that are applied to the earphones or speakers. The earphones and speakers can be responsive to several different synthesized emitters, as illustrated in Fig. 3, and to reflections resulting from the synthesized sound sources.

Column 9, line 50-column 10, line 24indicates the Arnold et al. system functions entirely differently from the Massie et al. system. In all embodiments of the Arnold et al. system, at least four electrical-acoustic transducers 16 (i.e., loudspeakers) surround the area from which the synthesized sound source is to be derived. The volume of acoustic energy derived from each speaker is varied to control the apparent position of a synthesized sound source coupled to a user who is inside all of the speakers.

The exemplary system illustrated in Fig. 12 and the description thereof at column 22, line 61-column 24, line 24, is a simple example that is helpful to explain how the Arnold et al. system works. Column 23, lines 14-30, includes an example wherein a synthesized sound source is located in rectangular region 1203 of a

rectilinear spatial environment having two dimensions. The entire spatial environment of Fig. 12 is surrounded by transducers (speakers) 16 so that one of the speakers is located close to each apex of the rectilinear area. The rectilinear area is divided into 9 rectangular regions from which a synthesized sound source can appear to emanate.

To make a sound seem to be located in region 1203, attenuation parameters from table 38, Fig. 1, are supplied as attenuation controllers to variable gain amplifiers 131 so that there is less attenuation and greater acoustic volume for the sound produced by the transducer 16 located close to region 1203 than the increased attenuation and decreased volume for the transducers located remote from region 1203. As a result of the lower attenuation applied to region 1203 than to the other regions of the rectilinear embodiment of Fig. 12, user 20, who is located in the center of the rectilinear coordinate system, hears the sound from speaker 16 that is closest to region 1203 with greater volume than the sound from the other speakers 16. To enable the user to believe the sound is coming from region 1203, sound from the other speakers 16 is coupled with differing degrees of intensity to the user.

In the three dimensional cylindrical system of Fig. 16, eight transducers, that is, speakers, 16 are located peripherally to regions having maximal radial and height components. Transducers 16 are equally spaced angularly over the full range of possible angular components that can be obtained from the three dimensional cylindrical coordinate system of Fig. 16 (column 26, lines 13-19). Transducers 16 can also be located with similar spacing peripheral to similar locations having a minimal height component for the spatial environment illustrated in Fig. 16. While Arnold et al. states that the three dimensional cylindrical coordinate system of Fig. 16 can include

other numbers of transducers 16 and that transducers 16 can be located at different positions with respect to the environment of Fig. 16, it is apparent that the system of Fig. 16 must have at least three transducers to provide simulated sound sources throughout the height and at any angle of the cylindrical coordinate system. In particular, to obtain attenuation to synthesize different regions within the cylindrical coordinate system of Fig. 16, in the radial, angular and height components, there must be more than two speakers.

Because of the requirement for the Arnold et al. system to include, in the cylindrical coordinate system of Fig. 16, more than two speakers, the Arnold et al. system is incompatible with the Massie et al. system that includes only left and right channels. Massie et al. is incapable of operating with more than two channels if headphones are employed.

The only embodiment of Massie et al. that is applicable to appellants' claims is the headphone embodiment. This is because all of appellants' claims require the audio output devices, such as headphones, to be actually or notionally located inside a cylindrical locus of points (claims 1, 28 and 46) or to be actually or notionally located closer to a user of the audio output devices than the positions of the synthesized sound sources (claims 15, 37 and 55). The Massie et al. embodiment employing speakers does not meet the foregoing requirements because speakers 14 and 16 are outside monitor 12, from which the synthesized sound source would be derived. In this regard, the Massie et al. device is intended for three-dimensional audio spatialization capabilities for video games, multimedia computer systems, virtual reality, cinema sound systems, home theater and home digital audio systems, for

example (column 3, lines 49-54). Consequently, if Massie et al. is employed for these purposes, the speakers could not meet the requirement of appellants' independent claims, as set forth above. Further, Massie et al. provides no disclosure of a system with more than two speakers. Thus, the Arnold et al. system that requires at least three speakers (in all likelihood more than three speakers are needed) cannot be employed with the Massie et al. system that only employs left and right channels. As a result, one of ordinary skill in the art would not have modified Massie et al. as a result of Arnold et al. because the Arnold et al. system is incompatible with the Massie et al. system.

D. Many of the dependent claims Include features not disclosed by either reference.

Claim 2 requires the audio field of claim 1 to be displaced in a direction parallel to the longitudinal axis of the cylindrical locus of points to change the portion of the field closest to a reference position where a user of the audio output devices is actually or notionally located. The Office Action relies on Arnold, Figs. 14-16, and Massie, Figs. 1B, 2-4, 9, 10 and 13, as well as column 4, lines 1-52, and column 5, line 1-column 6, line 18. Arnold et al. has no disclosure of displacing the three dimensional rectilinear coordinate system of Fig. 14, or the three dimensional rectilinear coordinate system of Fig. 15, or the cylindrical coordinate system of Fig. 16. In fact, the inference is just the opposite because loud speakers 16 are located, apparently fixedly, beyond the periphery of each of these coordinate systems. The reliance on Massie in

connection with claim 2 is not understood because the Examiner has admitted Massie fails to disclose a cylindrical locus of points.

Claim 3 requires the audio field of claim 2 to be rotated about the longitudinal axis of the cylindrical locus of points. The same portions of Arnold et al. and Massie et al. are relied on to reject claim 3 as are relied on to reject claim 2. However, there is no disclosure of rotating the Arnold et al. cylindrical field or any of the other fields about a longitudinal axis. The reliance on Massie et al. for the feature of claim 3 is obviously incorrect because the Examiner has admitted Massie et al. fails to disclose a cylindrical locus of points.

Claims 4, 16, 31, 38, 49 and 56 require the audio field to be displaced in the direction of an axis in discrete steps of predetermined magnitude. The same portions of Arnold et al. and Massie et al. are relied on. However, as discussed *supra*, there is no disclosure in either reference of displacing an audio field, and certainly not of displacing an audio field in discrete steps of predetermined magnitude.

Claims 5 and 17 require the synthesized sound sources to be located at different levels corresponding to floors of a building, and further require the predetermined magnitude of the discrete steps to correspond to moving up or down one floor. Again, the Examiner relies on the same portions of Arnold et al. and Massie et al. However, there is no disclosure in either reference of sound sources being located at differing levels corresponding to floors of a building, and of displacing an audio field at discrete steps corresponding to moving up or down one floor.

Claims 6 and 18 require the synthesized sound sources to be arranged in groups so that the sound sources in each group are at the same position along the axis and the groups are separated one from another along the axis by distances corresponding to multiples, including one, of the predetermined magnitude associated with displacing the audio field in the axis direction in discrete steps. The Examiner again relies on the same portions of the references. However, neither reference discloses arranging sound sources in groups, as defined by claims 6 and 18. While Massie et al. discloses multiple synthesized sound sources, there is nothing indicating they are arranged in groups, and separated from each other as claims 6 and 18 require.

Claims 9, 21, 34, 41, 52 and 59 require an audio indication of the synthesized sound sources that exist beyond a focus zone to be un-muted, in contrast to the sound sources that are outside of the focus zone that are fully muted. In other words, an audio signal is generated to indicate there are muted sound sources outside of a focus zone. The Office Action alleges Figs. 14-16, column 31, line 44-column 32, line 9, of Arnold et al. and Massie et al., Figs. 1B, 2-4, 9, 10 and 13, as well as column 4, lines 1-52, and column 5, line 1-column 6, line 18, disclose this feature. However, appellants are unable to find any disclosure in either of the references at the relied on places to disclose an audio indication of fully muted synthesized sound sources that are outside of a focus zone.

Claim 10 requires the audio field to be stabilized relative to one of a user's head, a user's body, a vehicle in which the user is traveling, and the world. The Office Action relies on Figs. 14-16 and column 31, line 44-column 32, line 9, of Arnold et al.

and Figs. 1B, 2-4, 9, 10 and 13, as well as column 4, lines 1-52, and column 5, line 1-column 6, line 18, of Massie et al. to disclose this feature. However, appellants are unable to find any mention in any of these portions of Arnold et al. or Massie et al. dealing with audio field stabilization.

Claims 10 and 22 further require the stabilization to take account of whether the audio output devices are world, vehicle, body or head mounted and, as appropriate, rotation of the user's head or body, or of the vehicle, about an axis parallel to the longitudinal axis of the cylindrical locus of points. Because the relied on portions of Massie et al. and Arnold et al. fail to disclose stabilization, certainly, these additional requirements of claims 10 and 22 are not disclosed in these references.

Claims 29 and 47 are apparatus claims requiring a processor arrangement (claim 29) or a rendering-position determining arrangement (claim 47) for setting the location of each synthesized sound source relative to an audio-field reference, and controlling an offset between the audio-field reference and a presentation reference determined by the location of audio output devices. A user input arrangement enables a user to set a displacement of the audio field relative to the presentation reference in a direction parallel to the longitudinal axis of the cylindrical locus of point. The rendering position of each synthesized sound source is derived based on the location of the sound source in the audio field and the offset. To reject these claims, the usual portions of Arnold et al. and Massie et al. are relied on. However, the Office Action fails to provide any information in the references regarding the claimed (1) audio-field reference, (2) offset between the audio-field reference and a presentation reference, or (3) an input enabling a user to set a displacement of the audio field relative to the

presentation reference in a direction parallel to the longitudinal axis of a cylindrical locus point, and appellants are unable to find any disclosure in the relied on portions of the references to support the examiner's contention.

Claims 30 and 48, respectively dependent on claims 29 and 47, require the apparatus to be operative to enable a user to set a rotation of the audio field about the longitudinal axis of a cylindrical locus of points. Because neither reference discloses a cylindrical locus of points, as discussed *supra*, claims 30 and 48 are improperly rejected on the usual portions of Massie et al. and Arnold et al. relied on by the Examiner.

Claims 62 and 63 specifically require the audio output to be headphones. While Massie et al. discloses headphones, the combination of Arnold et al. and Massie et al. is incompatible with a set of headphones because the Arnold et al. device, in order to achieve spatial simulation of synthesized sound sources in a cylindrical coordinate system, requires more than two electric to audio transducers, i.e., loud speakers.

Reversal of the final rejection is in order.

Respectfully submitted,

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VIII. Claims Appendix

1. An audio user-interfacing method in which each of a plurality of items is represented in an audio field by plural synthesized sound sources from where sounds related to the item appear to emanate, the method comprising the steps of:

   (a) determining, for each said sound source, an associated rendering position at which the sound source is to be synthesized to emit sounds in the audio field, the rendering positions associated with the sound sources being on at least a portion of cylindrical locus of points; and

   (b) generating, using plural audio output devices, an audio field in which said sound sources are synthesized at their associated rendering positions to provide sounds related to the items concerned, the audio output devices being actually or notionally located inside the cylindrical locus of points.

2. A method according to claim 1, including the further step of displacing the audio field in a direction parallel to the longitudinal axis of said cylindrical locus of points whereby to change the portion of the field closest to a reference position where a user of the audio output devices is actually or notionally located.

3. A method according to claim 2, including the further step of rotating the audio field about the longitudinal axis of said at cylindrical locus of points.

4. A method according to claim 2, in which the audio field is displaced in said direction in discrete steps of predetermined magnitude.

5. A method according to claim 4, wherein the longitudinal axis of said at least cylindrical locus of points is vertically disposed, the sound sources being located at differing levels corresponding to floors of a building, the predetermined magnitude of said discrete steps corresponding to moving up or down one floor.

6. A method according to claim 4, wherein the sound sources are arranged in groups with the sound sources in each group being at the same position along axis and the groups being separated one from another along said axis by distances corresponding to multiples, including one, of said predetermined magnitude.

7. A method according to claim 2, wherein sound sources located in the audio field outside of a focus zone fixed relative to said reference position, are at least partially muted relative to sound sources inside the focus zone; the sound sources being un-muted and muted as the sound sources move into and out of the focus zone in response to displacement of the audio field in said direction parallel to the axis of the cylindrical locus of points.

8. A method according to claim 7, wherein sound sources adjacent to, but outside of, the focus zone are partially muted whilst those farther from the focus zone are fully muted.

9. A method according to claim 7, wherein sound sources outside of the focus zone are fully muted, an audio indication of the sound sources existing beyond the focus zone in at least one direction being un-muted in the audio field.

10. A method according to claim 1, wherein the audio field is stabilised relative to one of:

- a user's head;
- a user's body;
- a vehicle in which the user is travelling;
- the world;

this stabilisation taking account of whether the audio output devices are world, vehicle, body or head mounted, and, as appropriate, rotation of the user's head or body, or of the vehicle, about an axis parallel to the longitudinal axis of the cylindrical locus of points.

11. A method according to claim 1, wherein further sound sources are synthesized to lie at different radial distances from the longitudinal axis of said cylindrical locus of points.

12. A method according to claim 1, wherein the longitudinal axis of said cylindrical locus of points is vertically disposed.

13. A method according to claim 1, wherein the longitudinal axis of said cylindrical locus of points is horizontally disposed.

14. A method according to claim 1, wherein at least some of the said items represented by the sound sources are audio labels for services, the method further including selecting a service by selecting the corresponding audio-label sound source.

15. An audio user-interfacing method in which each of a plurality of items is represented in an audio field by plural synthesized sound sources from where sounds related to the item appear to emanate, the method comprising the steps of:

(a) determining, for each said sound source, an associated rendering position at which the sound source is to be synthesized to sound in the audio field;

(b) generating, using audio output devices, an audio field in which said sound sources are synthesized at their associated rendering positions to provide sounds related to the items concerned, the audio output devices being actually or notionally located closer to a user of the audio output devices than the positions of the plural synthesized sound sources;

(c) exploring the audio field by rotating it about a predetermined axis; and

(d) exploring the audio field by displacing it in a direction parallel to said axis;

with steps (c) and (d) being effected in any order or together.

16. A method according to claim 15, in which in step (d) the audio field is displaced in said direction in discrete steps of predetermined magnitude.

17. A method according to claim 16, wherein said axis is vertically disposed, the sound sources being notionally grouped at differing levels corresponding to floors of a building, the predetermined magnitude of said discrete steps corresponding to moving up or down one floor.

18. A method according to claim 17, wherein the sound sources are arranged in groups with the sound sources in each group being at the same position along said axis and the groups being separated one from another along said axis by distances corresponding to multiples, including one, of said predetermined magnitude.

19. A method according to claim 15, wherein sound sources located in the audio field outside of a focus zone fixed relative to a notional user position, are at least partially muted relative to sound sources inside the focus zone; the sound sources being un-muted and muted as the sound sources move into and out of the focus zone

in response to displacement of the audio field in said direction parallel to the longitudinal axis of at least a portion of a cylindrical locus of points.

20. A method according to claim 19, wherein sound sources adjacent to, but outside of , the focus zone are partially muted whilst those further from the focus zone are fully muted.

21. A method according to claim 19, wherein sound sources outside of the focus zone are fully muted, an audio indication of the sound sources existing beyond the focus zone in at least one direction along said axis being un-muted in the audio field.

22. A method according to claim 15, wherein the audio field is stabilised relative to one of:

- a user's head;
- a user's body;
- a vehicle in which the user is travelling;
- the world;

this stabilisation taking account of whether the audio output devices are world, vehicle, body or head mounted, and, as appropriate, rotation of the user's head or body, or of the vehicle, about an axis parallel to the longitudinal axis of at least a portion of a cylindrical locus of points.

23. A method according to claim 15, wherein the sound sources are distributed over at least a portion of a cylindrical locus of points.

24. A method according to claim 15, wherein the sound sources are distributed in three dimensions in terms of a cylindrical coordinate system referenced to said axis.

25. A method according to claim 15, wherein said axis is vertically disposed.

26. A method according to claim 15, wherein said axis is horizontally disposed.

27. A method according to claim 15, wherein at least some of the said items represented by the sound sources are audio labels for services, the method further including selecting a service by selecting the corresponding audio-label sound source.

28. Apparatus for providing an audio user interface in which each of a plurality of items is represented in an audio field by at least one respective synthesized sound source from where sounds related to the item appear to emanate, the apparatus comprising:

- a processor arrangement for determining, for each said sound source, an associated rendering position at which the sound source is to be synthesized to

sound in the audio field, the rendering positions associated with the sound sources being distributed over at least a portion of a cylindrical locus of points; and

- plural audio output devices for generating an audio field in which said sound sources are synthesized at their associated rendering positions to provide sounds related to the items concerned, the audio output devices being actually or notionally located inside the cylindrical locus of points.

29. Apparatus according to claim 28, wherein the processor arrangement is arranged for:

(a) setting the location of each said sound source relative to an audio-field reference;

(b) controlling an offset between the audio-field reference and a presentation reference determined by the location of the audio output devices, the processor arrangement including a user input arrangement and being operative to enable a user to set a displacement of the audio field relative to the presentation reference in a direction parallel to the longitudinal axis of said cylindrical locus of points; and

(c) deriving the rendering position of each sound source based on the location of the sound source in the audio field and said offset.

30. Apparatus according to claim 29, wherein the processor arrangement is further operative to enable a user to set a rotation of the audio field about the longitudinal axis of said cylindrical locus of points.

31. Apparatus according to claim 29, wherein the processor arrangement is arranged to permit the audio field to be displaced in said direction only in discrete steps of predetermined magnitude.

32. Apparatus according to claim 29, further comprising a muting filter operative to at least partially mute sound sources with rendering positions located in the audio field outside of a focus zone fixed relative to said presentation reference.

33. Apparatus according to claim 32, wherein the muting filter is operative to only partially mute sound sources adjacent to, but outside of, the focus zone but to fully mute sound sources further from the focus zone.

34. Apparatus according to claim 32, wherein the muting filter is operative to fully mute sound sources outside of the focus zone, the apparatus including an indicator arrangement for providing an un-muted audio indication of the sound sources existing beyond the focus zone in at least one direction along said axis.

35. Apparatus according to claim 28, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for selecting a service by selecting the corresponding audio-label sound source.

36. Apparatus according to claim 29, wherein the processor arrangement is arranged for varying the said offset such as to stabilise the audio field reference relative to one of:

- a user's head;
- a user's body;
- a vehicle mounting the apparatus;
- the world.

37. Apparatus for providing an audio user interface in which each of a plurality of items is represented in an audio field by plural respective synthesized sound sources from where sounds related to the item appear to emanate, the apparatus comprising:

- audio output devices, the audio output devices being actually or notionally located closer to a user of the audio output devices than the positions of the plural synthesized sound sources;

- a processor arrangement for:

  (a) determining, for each said sound source, an associated rendering position at which the sound source is to be synthesized to sound in the audio field,

  (b) setting the location of each said sound source relative to an audio-field reference;

  (c) controlling an offset between the audio-field reference and a presentation reference determined by the location of the audio output devices;

the processor arrangement including a user input arrangement and being operative to enable a user to:

set a rotation of the audio field about a predetermined axis,

set a displacement of the audio field relative to the presentation reference in a direction parallel to said axis; and

the processor arrangement being arranged for deriving the rendering position of each sound source based on the location of the sound source in the audio field and said offset;

- the audio output devices and the processor arrangement being arranged for generating an audio field in which said sound sources are synthesized at their associated rendering positions to provide sounds related to the items concerned.

38. Apparatus according to claim 37, wherein the processor arrangement is such that the offset is arranged to permit the audio field to be displaced in said direction only in discrete steps of predetermined magnitude.

39. Apparatus according to claim 37, further comprising a muting filter operative to at least partially mute sound sources with rendering positions located in the audio field outside of a focus zone fixed relative to said presentation reference.

40. Apparatus according to claim 39, wherein the muting filter is operative to only partially mute sound sources adjacent to, but outside of, the focus zone but to fully mute sound sources farther from the focus zone.

41. Apparatus according to claim 39, wherein the muting filter is operative to fully mute sound sources outside of the focus zone, the apparatus including an indicator arrangement for providing an un-muted audio indication of the sound sources existing beyond the focus zone in at least one direction along said axis.

42. Apparatus according to claim 37, wherein the processor arrangement is arranged so that the rendering-position determination is so as to cause said sound sources to be on an at least a portion of a cylindrical locus of points.

43. Apparatus according to claim 37, wherein the processor arrangement is arranged so that the rendering-position determination is so as to cause the sound sources to be distributed in three dimensions in terms of a cylindrical coordinate system referenced to said axis.

44. Apparatus according to claim 37, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for selecting a service by selecting the corresponding audio-label sound source.

45. Apparatus according to claim 37, wherein the processor arrangement is arranged for varying the said offset such as to stabilise the audio field reference relative to one of:

- a user's head;
- a user's body;
- a vehicle mounting the apparatus;
- the world.

46. Apparatus for providing an audio user interface in which each of a plurality of items is represented in an audio field by plural respective synthesized sound sources from where sounds related to the item appear to emanate, the apparatus comprising:

- a rendering-position determining arrangement operative to determine, for each said sound source, an associated rendering position at which the sound source is to be synthesized to sound in the audio field, the rendering positions associated with the sound sources being on an at least a portion of a cylindrical locus of points; and
- a rendering subsystem, including audio output devices, arranged to generate an audio field in which said sound sources are synthesized at their associated rendering positions to provide sounds related to the items concerned, the audio output devices being actually or notionally located inside the cylindrical locus of points.

47. Apparatus according to claim 46, wherein the rendering-position determining arrangement comprises:

- a setting arrangement for setting the location of each said sound sources relative to an audio-field reference;
- a control arrangement for controlling an offset between the audio-field reference and a presentation reference determined by the location of the audio output devices, the control arrangement including a user input arrangement and being operative to enable a user to set a displacement of the audio field relative to the presentation reference in a direction parallel to the longitudinal axis of the cylindrical locus of points; and
- a deriving arrangement operative to derive the rendering position of each sound source based on the location of the sound source in the audio field and said offset.

48. Apparatus according to claim 47, wherein the control arrangement is further operative to enable a user to set a rotation of the audio field about the axis of said cylindrical locus of points.

49. Apparatus according to claim 47, wherein the control arrangement is arranged to permit the audio field to be displaced in said direction only in discrete steps of predetermined magnitude.

50. Apparatus according to claim 47, further comprising a muting filter operative to at least partially mute sound sources with rendering positions located in the audio field outside of a focus zone fixed relative to said presentation reference.

51. Apparatus according to claim 50, wherein the muting filter is operative to only partially mute sound sources adjacent to, but outside of, the focus zone but to fully mute sound sources further from the focus zone.

52. Apparatus according to claim 50, wherein the muting filter is operative to fully mute sound sources outside of the focus zone, the apparatus including an indicator arrangement for providing an un-muted audio indication of the sound sources existing beyond the focus zone in at least one direction along said axis.

53. Apparatus according to claim 46, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for selecting a service by selecting the corresponding audio-label sound source.

54. Apparatus according to claim 47, wherein the control arrangement for controlling the offset is arranged for varying the offset such as to stabilise the audio field reference relative to one of:

- a user's head;
- a user's body;
- a vehicle mounting the apparatus;
- the world.

55. Apparatus for providing an audio user interface in which each of a plurality of items is represented in an audio field by plural respective synthesized sound sources from where sounds related to the item appear to emanate, the apparatus comprising:

- a rendering-position determining arrangement operative to determine, for each said sound source, an associated rendering position at which the sound source is to be synthesized to sound in the audio field, the rendering-position determining arrangement comprising:
  - a setting arrangement for setting the location of each said sound source relative to an audio-field reference;
  - a control arrangement for controlling an offset between the audio-field reference and a presentation reference determined by the location of audio output devices, the control arrangement including a user input device and being operative to enable a user:
  - to set a rotation of the audio field about a predetermined axis, and
  - to set a displacement of the audio field relative to the presentation reference in a direction parallel to said axis; and
  - a deriving arrangement for deriving the rendering position of each sound source based on the location of the sound source in the audio field and said offset; and
- a rendering subsystem, including the audio output devices, operative to generate an audio field in which said sound sources are synthesized at their associated rendering positions to provide sounds related to the items concerned, the audio output devices being actually or notionally located closer to a user of the audio output devices than the positions of the plural synthesized sound sources.

56. Apparatus according to claim 55, wherein the control arrangement is operative to permit the audio field to be displaced in said direction only in discrete steps of predetermined magnitude.

57. Apparatus according to claim 55, further comprising a muting filter operative to at least partially mute sound sources with rendering positions located in the audio field outside of a focus zone fixed relative to said presentation reference.

58. Apparatus according to claim 57, wherein the muting filter is operative to only partially mute sound sources adjacent to, but outside of, the focus zone but to fully mute sound sources further from the focus zone.

59. Apparatus according to claim 57, wherein the muting filter is operative to fully mute sound sources outside of the focus zone, the apparatus including an arrangement operative to provide an un-muted audio indication of the sound sources existing beyond the focus zone in at least one direction along said axis.

60. Apparatus according to claim 55, wherein the rendering-position determining arrangement is operative to cause said sound sources to on at least a portion of a cylindrical locus of points.

61. Apparatus according to claim 55, wherein the rendering-position determining arrangement is operative to cause the sound sources to be distributed in three dimensions in terms of a cylindrical coordinate system referenced to said axis.

62. Apparatus according to claim 55, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for selecting a service by selecting the corresponding audio-label sound source.

63. Apparatus according to claim 55, wherein the control arrangement is arranged for varying the said offset such as to stabilise the audio field reference relative to one of:

- a user's head;
- a user's body;
- a vehicle mounting the apparatus;
- the world.

64. Method according to claim 1, wherein the audio output devices are stereo headphones on the head of a user.

65. Apparatus according to claim 28, wherein the audio output devices are stereo headphones on the head of a user.

66. The method of claim 15 wherein the rendering position associated with each of the sound sources is on at least a portion of a cylindrical locus of points.

67. The apparatus of claim 37 wherein the rendering position associated with each of the sound sources is on at least a portion of a cylindrical locus of points.

68. The apparatus of claim 55 wherein the rendering position associated with each of the sound sources is on at least a portion of a cylindrical locus of points.

IX. Evidence Appendix

None.

X. Related Proceedings Appendix

None.